

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 May 2001 (10.05.2001)

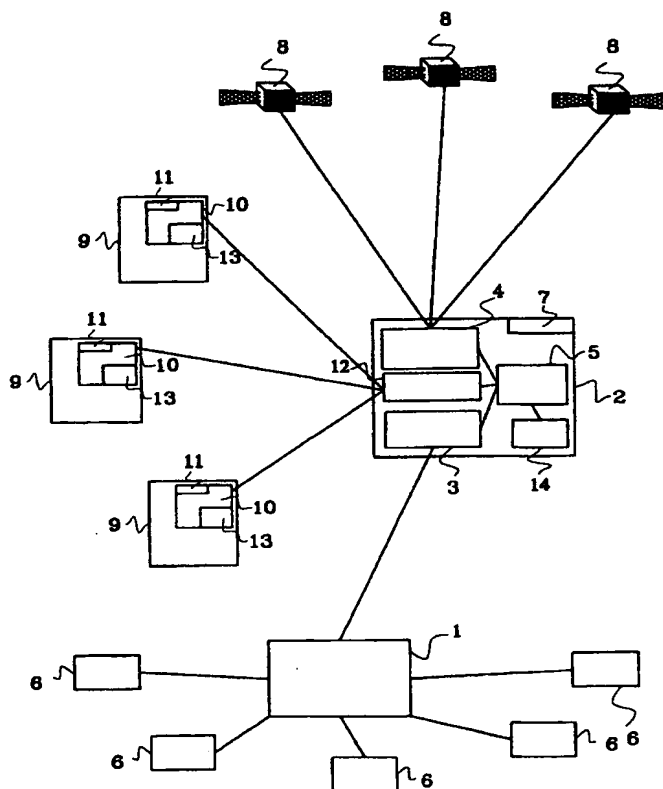
PCT

(10) International Publication Number
WO 01/33247 A1

- (51) International Patent Classification?: G01S 5/00, G08G 1/127
- (72) Inventor; and
(75) Inventor/Applicant (for US only): DE BONNENFANT, Björn [SE/SE]; Själagårdsgatan 8A, S-111 31 Stockholm (SE).
- (21) International Application Number: PCT/SE00/02162
- (22) International Filing Date: 3 November 2000 (03.11.2000)
- (74) Agent: EHRNER & DELMAR PATENTBYRÅ AB; Box 103 16, Gumshornsgatan 7, S-100 55 Stockholm (SE).
- (25) Filing Language: Swedish
- (26) Publication Language: English
- (30) Priority Data: 9903993-5 3 November 1999 (03.11.1999) SE
- (81) Designated States (national): AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KR (utility model), KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (71) Applicant (for all designated States except US): SAT-SAFE MLS AB [SE/SE]; Box 27165, S-102 52 Stockholm (SE).

[Continued on next page]

(54) Title: POSITION FINDER FOR VEHICLES AND CARGO CARRIERS



(57) Abstract: A system for determining the position of communication units (10) for mounting on vehicles, containers or similar, and mobile units (2) for mounting on vehicles. The system comprises mobile units (2) with identity codes, a central unit (1) for receiving information from the mobile units (2), and communication units (10), stating their identities to the present mobile unit (2). The mobile unit (2) comprises a GPS-receiver (4) or similar, a communication device (12) arranged to communicate with the communication unit (10) of the cargo carrier, a control unit (5) arranged to read the information from the receiver (4), and based on this information send control signals to a transmitter (3) and to the communication device (12), and a GSM-transmitter (3) or similar for sending information regarding the position and identity of the mobile unit (2), and the identities of present cargo carriers to said central unit (1). Both the communication unit (10) and the mobile unit (2) may be provided with detectors (13, 14), which may detect activity in the surroundings.

WO 01/33247 A1

WO 01/33247 A1

(84) **Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

POSITION FINDER FOR VEHICLES AND CARGO CARRIERS.

FIELD OF THE INVENTION

The present invention relates to a system and a method according to the preamble of the appended independent claims.

BACKGROUND OF THE INVENTION

Systems combining a device for determining the position of an object with a transmitter arranged to send the position of the object to a central unit at regular time intervals are today commercially available. The device for determining the position may, as an example, be a GPS-receiver, but alternative systems exist. GPS-receivers receive short radio sequences from a number of satellites intended for that purpose and can, from the time difference between reception times for the sequences from the different satellites, calculate the position with a high degree of accuracy. The transmitter may, for example, be a GSM-based mobile phone. The GPS-receiver gives the calculated position of the object and the GSM-transmitter passes this to a central unit. Characterising features for systems of this kind is that they are too power consuming, expensive and large to be used for determining the position of small, cheap objects.

Systems sending information on the status of a plant and, in case the plant is mobile, the position, via some form of radio transmitter to a central unit, or controls a plant by control signals received by radio from a central unit are also commercially available. The advantage of sending information from or to the plant with radio signals is obvious if the plant is mobile, but this may also be appropriate if the plant is fixed and geographically situated in an area that lacks other means

of communication. This kind of system is also too power consuming, expensive and large for use in a cost-effective way for transmission of information on the status of the object, controlling objects or determination of the position of object
5 if these are too small or cheap.

PURPOSE OF THE INVENTION AND ITS CHARACTERISING FEATURES

It is a purpose of the invention to provide a system and method that does not suffer from the disadvantages of known technology. This purpose is achieved by combining a device for
10 determination of the position of a vehicle, which sends information of this to a central unit, with simple transponders that may be mounted on a cargo carrier, for example boxes for transportation or post bags, which states their identity to the transport vehicle provided with such a device. The device
15 may then transmit the information regarding present cargo carriers, and their position, to the central unit, without the need for providing each cargo carrier with a complete device for transmission over longer distances and calculation of the position of the cargo carrier. This and other purposes are
20 achieved with a system and a method according to the characterising portions of the appended independent claims.

According to a further aspect of the present invention, the transponders can, with the aid of in-built detectors, detect that the cargo carriers, on which they are mounted, have been
25 moved, and send that information to the device on the vehicle. Through this it is achieved that the driver of the vehicle automatically may receive information regarding which cargo carriers that probably have been loaded on or off, and may observe that incorrect, too many or too few cargo carriers have
30 been loaded on or off. This information can also be transmitted to a central unit for further reducing the risk of cargo

carriers being erroneously transported or lost. Transponders with such detectors, which detects that the cargo carrier has been moved, further has the advantage that they react independent of whether the cargo carriers are loaded into or out
5 of the main opening or some side opening of a vehicle or a plant.

According to yet a further aspect of the present invention the advantage is achieved that the transponders only send information when either the detectors on the cargo carriers states
10 that they are being moved or when the device on the vehicle states its presence or when the device on the vehicle detects activity on the vehicle using sensors, for example when a door on a truck is being opened. This decreases the power consumption of the transponders and makes it possible to make these
15 smaller and cheaper. By combining several of these methods and devices for detecting that a cargo carrier is being moved or loaded into or out of a vehicle or a plant, even greater reliability of the system is achieved. If one part of the system is prevented from working, one or several of the other parts
20 are working. Cargo carriers with such detectors may be an advantageous complement if the vehicle or the plant is provided with sensors that detect passage of a cargo carrier through a load port, but if this sensor is prevented from functioning, for example by loading the cargo carrier in or out through a
25 port which is not intended for loading, and is not provided with such as sensor, or alternatively the sensor may intentionally be a put out of function during attempts to theft.

OVERVIEW OF THE DRAWINGS

Figure 1 shows a schematic picture of the total system.

30 DESCRIPTION OF AN EMBODIMENT

Figure 1 shows the three main components in the system: A mobile unit 2 for mounting in a vehicle, communication devices 10, mounted on cargo carriers 9 and a central unit 1.

5 The mobile unit 2 comprises a receiver 4 for reception of satellite signals, from which the position of the mobile unit 2 can be calculated, for example a GPS-receiver, a communication device 12, for example of a radio- or IR-transmitter/receiver, which can communicate with a communication unit 10, mounted on the cargo carrier 9, a transmitter 3, for example a GSM-transmitter, for transmission and, if necessary, reception of in-
10 formation to and from the central unit 1, and a control unit 5, which reads the information from the receiver 4, the communication device 12, and if necessary, the transmitter 3. The mobile unit 2 may also comprise a sensor 14, which detects ac-
15 tivity on the mobile unit 2, and the control unit 5 can read this information. Each mobile unit 2 is provided with a unique identification code 7.

Each communication unit 10, is mounted on a cargo carrier 9, and is provided with a unique identification code 11. The com-
20 munication unit 10 can via, for example, radio- or IR-signals, communicate with the communication device 12 on the present mobile unit 2. The communication unit 10 may also be provided with a detector 13, which is able to detect changes in the surroundings, such as that the cargo carrier 9 is being moved
25 or that a vehicle or a person is approaching.

The detector 13 may function according to several principles, and can also control the communication unit 10 to send its identity to a communication device 12, when one of or a combination of several criteria are fulfilled. The detector 13 can
30 react when the communication unit is lifted, dropped, or moved horizontally, which indicates that the cargo carrier is being

moved and loaded into or out of a vehicle or a plant. Since a cargo carrier may be displaced or fall down during transportation, the detector may advantageously react only when, or in combination with a such detector react on human presence and activity, such as a heat- and/or a light detector. This has the additional advantage that the detector also reacts at attempted thefts. For automated loading other detectors are more appropriate, and examples of such detectors are light, sound or magnetic detectors.

- 10 The central unit 1 is able to communicate with the receiver 3 on the mobile unit 2. The information it receives from the mobile unit 2 may then be transmitted to customer units 6, and if necessary control signals or other information from a customer unit 6, may be transmitted to the mobile unit 2.
- 15 The function of the system is based on one or several communication units 10 mounted on cargo carriers 9 stating their identities 11 to a mobile unit 2. These identities 11 are transmitted from the communication unit 10 to the communication device 12, when the detector 13 detects activity in the vicinity of the cargo carrier 9, or when the communication device 12 sends a request for present communication units 10 to state their identities 11. An advantageous way of achieving a high degree of reliability regarding registration of present cargo carriers, is that present communication units 10 states their identities both when the detector 13 detects activity in the vicinity of the cargo carrier 9, and when the communication device 12 sends a request that present communication devices 10 to state their identities 11. The communication unit 12 may be controlled to send such requests when the control unit 5, by regularly reading the position of the vehicle from the receiver 4, registers that the vehicle is not moving, or

when the sensor 14 indicates activity on the vehicle, which may for example indicate that a cargo door has been opened, which may be interpreted as that cargo carriers are being loaded on or loaded off. The mobile unit 2 registers the identities 11 of present communication units 10, and sends this information, and information regarding the identity 7 of the mobile unit, its position and the time to the central unit 1. This information may then be transmitted to custom units 6, and the owner or the manager of the vehicle and the cargo carriers may in this way receive updated information regarding the position of the cargo carriers. Further information is received regarding the activities and positions of the vehicles. With a further addition to the described embodiment (not shown), information may be sent from the vehicle to the central unit 1 regarding which cargo carriers that have been loaded off or on by the driver manually, using for example a keyboard, providing the mobile unit 2 with such information, or the driver may verify which cargo carriers have been loaded on or off from a list of communication units 10, which has stated that these have been moved. Further the central unit 1 may send information to the mobile unit 2 regarding which cargo carriers 9 that should be loaded on or off, and this information may then be presented on a display.

Even if the invention has been described in connection with a preferred embodiment it should be understood that a plurality of modifications may be done without departing from the scope of the invention. One such modification is that the transmitter 3 sends information regarding the position of the mobile unit 2 to the central unit 1 regularly, in order to give continuously updated information regarding the position of the vehicle. A further modification is that the communication between the communication units 10 and a mobile unit 2 may be

regulated with a control algorithm such that conflicts are avoided, for example by each single communication unit 10 sending information in turn. For more complex systems, with several central units 1, corresponding modifications of the system and the method such as control of the communication between the different parts in the system may be done.

CLAIMS

1. System for determining the position of a least one mobile unit (2) and at least one communication unit (10) for mounting on a cargo carrier (9), **characterised in**
- a central unit (1) for receiving, storing and evaluating received digital information from said mobile unit (2), and if necessary transmitting this information to an external customer unit (6), and
 - that the communication unit (10) is arranged to send signals to said mobile unit (2) stating its identity (11), and
 - at least one mobile unit (2), provided with a unique code for identifying the identity (7) of the unit (2), comprising:
 - a receiver (4) which outputs signals from which the position of said mobile unit may be calculated,
 - a communication device (12) arranged to communicate with the communication unit (10) of the cargo carrier (9),
 - a control unit (5) arranged to read the information received from said receiver (4), and based on this information send control signals to said transmitter (3) and to said communication device (12), and
 - a transmitter (3) for sending information regarding at least the position of the mobile unit (2) and the identity (11) of the mobile unit (2) and present cargo carriers (9) via radio signals to said central unit (1).
2. System according to claim 1, **characterised in** that said receiver (4) is a GPS-receiver.

3. System according to claim 1 or 2, **characterised in** that said communication unit (10) is provided with at least one detector (13), which is able to detect changes in the surroundings.

5 4. System according to one of claims 1-3, **characterised in** that said mobile unit (2) is provided with at least one sensor (14), which can detect activity on said mobile unit (2).

5. Method for determining the position of at least one mobile unit (2) and at least one communication unit (10) for mounting on a cargo carrier (9), **characterised in** that

- the communication unit (10) states its identity (11), via a chosen communication medium to a communication device (12) on said mobile unit (2)
- 15 - a control unit (5) in said mobile unit (2) sends control information to the communication device (12) when
- said control unit (5) has at least received information regarding the identities (11) of all present cargo carriers (9), that
- 20 - said transmitter (3) shall send information to a central unit (1) regarding
- the identity (7) of said mobile unit (2), the position stated by a receiver (4) on said mobile unit (2), for calculating the position of said mobile unit (2), the time of the event, and the identities (11) of present cargo carriers (9),
- 25 - a central unit (1) receives, stores and evaluates received digital information from said mobile unit (2), and if necessary transmits this information to an external customer unit (6), where
- 30 - said central unit (1) notifies an operator or sends, if necessary, information to an external customer unit (6),

regarding at least the latest position of the mobile unit (2) and the cargo carrier (9).

6. Method according to claim 5, **characterised in** that said receiver (4) is a GPS-receiver.

7. Method according to claim 5 or 6, **characterised in** that said communication unit (10) on said cargo carrier (9) sends its identity to said mobile unit (2), when the communication unit (10) detects a change in the surroundings with a detector (13) on said communication unit (10).

8. Method according to one of claims 5-7, **characterised in** that said mobile unit (2) sends a request to present communication units (10) to state their identities (11) when a sensor (14) on said mobile unit (2) detects activity on said mobile unit (2).

9. Method according to one of claims 5-8, **characterised in** that said mobile unit (2) sends a request to present communication units (10) to state their identities (11) when said receiver (4) detects that said mobile unit (2) is not moving.

1/1

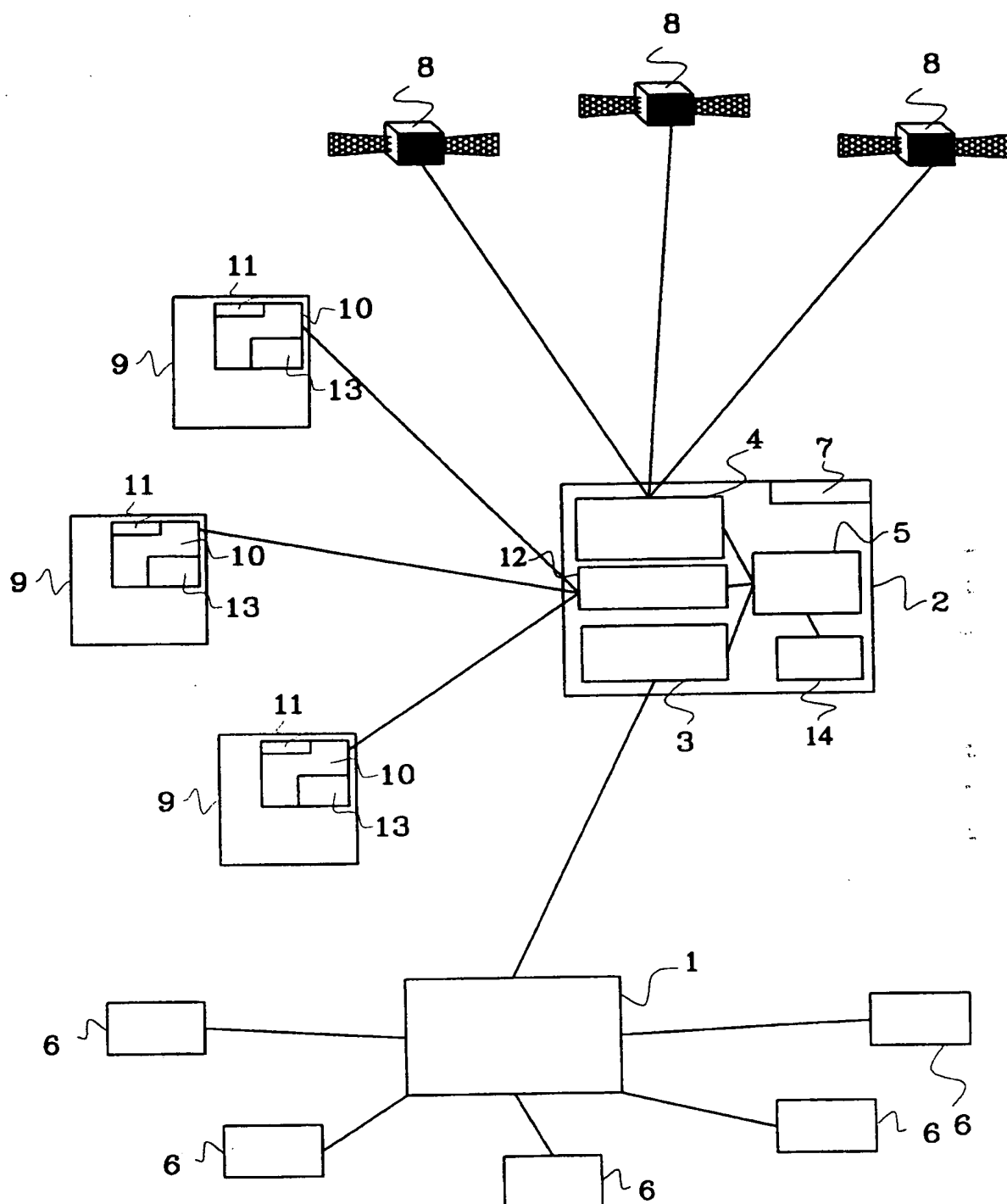


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/02162

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G01S 5/00, G08G 1/127

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G01S, G08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9933040 A (TRANSPORTONLINE AS), 1 July 1999 (01.07.99), see the whole document --	1,2,4-6
X	US 5959568 A (L.A.WOOLLEY), 28 Sept 1999 (28.09.99), column 16, line 26 - line 45; column 17, line 58 - column 18, line 4, figures 2, 5 --	1-7
X	DE 4213110 A1 (SCHMIDTCHEN,KARL-HEINZ), 28 October 1993 (28.10.93), column 2, line 4 - column 3, line 58, figures 1-3 --	1,2,5,6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

6 February 2001

Date of mailing of the international search report

22 -02- 2001

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Göran Magnusson /itw
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/02162

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 19504733 A1 (SIEMENS AG), 8 August 1996 (08.08.96), column 2, line 54 - column 3, line 24, figure 1 -- -----	1,2,4-6

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/SE 00/02162

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
WO	9933040	A	01/07/99	AU 1892599 A NO 975999 A	12/07/99 21/06/99
US	5959568	A	28/09/99	AU 3582997 A CA 2258278 A WO 9749972 A	14/01/98 31/12/97 31/12/97
DE	4213110	A1	28/10/93	NONE	
DE	19504733	A1	08/08/96	NONE	